

Communications, the New Decisive Tool In Respect to the Joint Strike Fighter

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Communications, the New Decisive Tool
In Respect to the Joint Strike Fighter
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INTRODUCTION

In today's conflicts it is evident that our dominance in the skies above the battleground allows greater freedom of maneuver and action by ground combat elements.¹ "The purpose of the Joint Strike Fighter (JSF) Program is to affordably develop the next generation strike fighter weapons system to meet an advanced threat (2010 and beyond), while improving lethality, survivability, and supportability."² As such, the Joint Strike Fighter (F-35) has been chosen to replace numerous aircraft platforms for the Air Force, Navy and Marine Corps, hoping that this new airplane will catapult their aging fleets into the next generation. As development continues, the Marine Corps should pursue the JSF due to its combat multipliers and the promise of revolutionary technology delivering enhanced targeting, jamming capabilities, digital data link and increased survivability to revolutionize employment concepts for this new aircraft.

Though the Marine Corps has specific requirements unique to itself, in a joint operations world, interoperability is a key performance parameter. "The threshold is for the JSF to meet 100 percent of critical, top level Information Exchange Requirements (IER). Critical top level IERs are those which if not met, will severely and adversely impact a war fighter mission."³

Communications is crucial in that it not only contributes to the survivability of the aviator, but it can provide almost real time situational awareness to the Commander. The JSF is technically revolutionary in its capability to enhance the Marine Corps fight and can be expanded with emerging technology in the future.

WHY IS COMMUNICATION IMPORTANT?

What does communication do for the aviator, the Marine Corps and the Commander? The communications aspect of the Joint Strike Fighter can not be discounted. Communication is not only used for positive control of aircraft, but is also important when considering the interface of information between the pilot and the aircraft. Additionally communications improves the situational awareness, in the cockpit or command center.

First, as a Forward Air Controller (Airborne)/ Tactical Air Controller (Airborne) (FAC(A)/TAC(A)) by providing Strike Control and Reconnaissance (SCAR) the aircraft is able to provide positive control of the aircraft and missile missions areas. Additionally, the communications suite can provide the pilot with situational awareness through correlation and fusion of on-board systems, and available off-board information to satisfy the sequence and pace of mission events. LtGen Rhodes, of USMC Combat Development Command has unique insight into current communications developments and strongly believes that an investment of C4I concepts and new technologies will grant access to world-wide command information

architecture to forward commanders.⁴

Secondly, inside the cockpit, there are several things taking place. For example, the pilot must follow assigned way points to and from the target area, conduct weapon and target analysis, avoid Anti-Aircraft Artillery (AAA), Surface to Air Missile (SAM) envelopes, employ High Speed Anti-radiation Missile (HARM) and of course, destroy any hostile aircraft enroute.⁵ With that in mind, one cannot overwhelm a pilot with the influx of too much information or too many tasks. ". . . [T]he JSF must automatically fuse data into an easy, understandable format to the aircrew. . ."⁶ The fusion information interface can assist in flight management workload to provide unambiguous information. This leads to more rapid decisions based on extremely accurate data.

The JSF cockpit features a large 8x20 inch color display providing tactical information as well as aircraft system data. A next generation voice command system allows the pilot to manage systems without manual input, simply using voice commands to do such tasks as changing radio channels. If a threat warning or another pilot is coming from the right side of the aircraft, the pilot takes notice of the broadcast in his right ear. All of this technology is designed to make the interface between man and machine more familiar and informal.

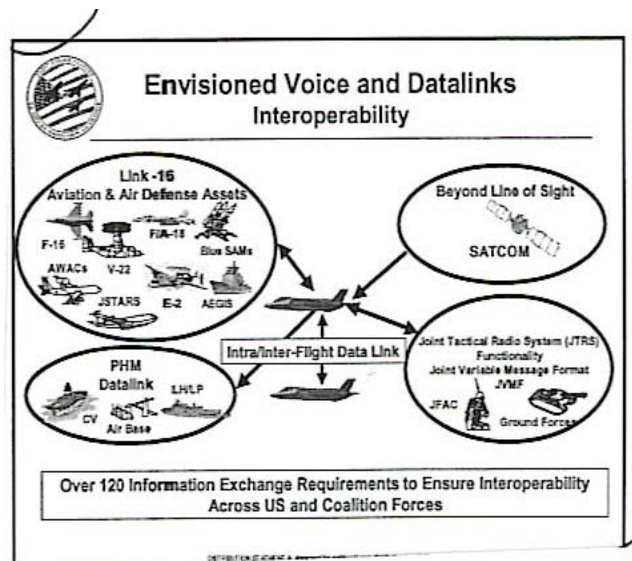
THE HORNET (F/A 18)

The Marine Corps has decided to replace the Hornet (F/A-18), with the Joint Strike Fighter (F-35). From the communications aspect, one must first understand the functions and capabilities of the Hornet in order to determine if the JSF meets future requirements of affordability, upgradeability and interoperability within joint task forces. The Hornet's (F/A-18) current communications suite is basic; however, it has numerous capabilities. Communications include dual AN/PRC-210, UHF/VHF tactical radios with frequency hopping, Have Quick and secure communications capability, as well as a two-way link 4 data capability (some have been upgraded to DOD data Link 16) and a KY-67 (an automatic resynchronization, automatic antenna matching, and digital data transmission at 16 kbps.)⁷

JOINT STRIKE FIGHTER

The JSF is a new dynamic multipurpose aircraft, but can the JSF achieve the Marine Corps mission 2010 and beyond for C4SIR? There are a lot of capabilities and advanced technologies being incorporated into the Joint Strike Fighter as a fifth generation fighter aircraft. However, from a communications aspect, is the JSF interoperable with Marines on the ground, Sailors on the sea and other aircraft? Undoubtly the answer is yes. As per the Operational Requirement Document, the Marine Corps stressed that its STOVL version JSF must be ". . . fully interoperable with joint and combined forces".⁸

Lockheed Martin transferred hours of experience from the F-22 and incorporated those lessons learned into the JSF. Technology is ever changing and the JSF hardware and software architecture shall be sufficiently modular and scalable to allow ready and affordable insertion of new technologies and operational functionality with minimal testing required.⁹



The above diagram depicts the Joint Strike Fighter communications suite concept. For example, the JSF is equipped with an Intra/Inter Flight Data link with other JSF aircraft. Although this feature is within other aircraft, the vision is to incorporate this data link with other assault aircraft (i.e. Blue Force Tracker).

The Link 16 data link is DOD's current data requirement and it has proven operable on the battlefield in past conflicts. This data link provides rapid, secure, and jam resistant communications, navigation and identification capabilities as depicted in the diagram, Link 16 exchange data to and from agencies (AWACS), other aircraft, and the commander. These sophisticated data links will connect the aircraft to both ground combat elements and airborne platforms. In addition to a Link 16 and a fighter-to-fighter Intra Flight Data Link, the F-35 will be the first Marine Corps airplane to have both transmit and receive satellite communications capabilities.

AIRCRAFT EXPANDABLES

In wars past, radar jamming was often broadband and omnidirectional. A new brand of jamming is possible with a new radar that can fulfill operational needs to include disabling key enemy capabilities. That new radar is the active electronically scanned array (AESA) "[I]t has an exceptionally agile beam, and provides nearly instantaneous track updates throughout the field of vision. In short, this radar is capable of targeting and jamming simultaneously. Other benefits of the radar include enhanced multi-target tracking capability and elimination of the need for a hydraulic system,"¹⁰ which reduces weight and maintenance failures.

A distributed Aperture Infrared Sensing system will provide full spherical IR coverage around the aircraft. In addition to providing warnings of missile launches, information from the system can be displayed on the pilot's helmet visor permitting the pilot to see through the airplane in all directions and eliminating the need for night vision goggles (cockpit does not have heads up display, rather the information is displayed on the pilot's visor).

"JSF must be able to send and receive weather, command, control, intelligence, surveillance, and reconnaissance information and work as part of the C4I architecture".¹¹ The two organic radar altimeters fulfill this criteria. For example, the altimeters provides improved measurement performance and new capabilities, which allow the airplane to determine ocean topography, map and monitor most land surfaces and determines wind speed thus supporting weather and sea state forecasting.¹²

EMPLOYMENT SCENARIO

Currently, as the DASC receives real time target identifiers, they are prioritized and filled with assets that are: (1) inbound to a control area, (2) airborne at the CAS holding point, (3) diverted from another lower priority mission, or (4) launched from forward operating bases. The pilots are

briefed on the following: updated friendly and threat situation, friendly artillery status, routing, target, working frequencies and final controller.¹³ Once communication is established with the terminal controller (if required), the pilot verifies the nine line (all transmission via radio communication). In most cases, data is transmitted through single channel, UHF, in the clear (non-secure) media. Radio transmissions create an electronic signature that can be detected (detection can lead to jamming). Radio communications can be easily jammed, once jammed the pilot has few options available to communicate with elements on the ground. In most instances, the Hornet pilot is required to be "heads down" while locating and prosecuting targets. Radar and targeting POD information is displayed inside the cockpit, at the most preferred target profiles. The pilot may not have "eyes on" until weapons release, or possibly not at all. Without an on-board Infrared (IR) threat warning system the aircraft is vulnerable to unobserved surface-to-air missiles. However, the pilot can minimize the threat by altering his flight profile and using a wing man to observe vulnerable directions of attack. As discussed in MCDP-1, war is unpredictable and weather is an element that increases that unpredictability. When the weather is bad and the clouds are low the F-18 is sometimes forced below

the clouds due to sensor limitations. By descending, the aircraft is exposed to a greater number of anti-air systems that could not otherwise range it.

Looking forward, procedurally the JSF would perform the same. However, with data links in place, radio transmissions would be faster, more secure, and reliable. The JSF, with the Active Electronically Scanned Array Radar (AESA), can not only fly missions during adverse weather, detect long range targets, and provide near precision self targeting, but it increases survivability in that the pilot is not required to dip to lower altitudes to engage targets. Having been successfully tested in the F/A-18 . . . "active array radar like the APG-79, the radar beam can be steered at close to the speed of light. This rapid beam scan feature enables superior performance and capabilities. The APG-79 is more lethal, more survivable, more reliable and more affordable than its mechanical cousins."¹⁴ Utilizing data links means less people transmitting via radio and by extension a decrease in human error. One of the most important benefits of this system is that the avionics suite with its ability to project information onto the helmet's visor, can decrease the pilot heads down time while increasing the time he has eyes on target (literally and

virtually). When coupled with the JSF's on-board IR threat warning system, (which also automatically alerts and cues the pilot to threat locations) dramatically increases situational awareness and survivability.

CONCLUSION

In conclusion, the Marine Corps mention C4ISR architecture several times in the DOD JSF Operational Requirement Documents, which indicates the great importance that the higher echelon places on communications to the future of warfare. "Communications is our link to friendly forces and reinforcement when we are operating separately."¹⁵ Communications enhances situational awareness, aids in survivability, and it is imperative to overall mission accomplishment which includes winning wars with fewer fatalities. The Joint Strike Fighter allows the pilot to engage as a fighter/tactician instead of an input device. The Joint Strike Fighter coupled with Link-16, UHF and SATCOM (beyond LOS) allows the flexibility to communicate with other aircraft, Marines and troops on the ground.

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